

Public Health Partnership Strategies for Rebuilding the Health of a Community following an Environmental Disaster

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USC Center for Public Health Preparedness



Bridging the Public Health Community



Goals

- Following this presentation the audience will:
 1. Understand the public health issues that drive the rebuilding efforts following a large environmental event
 2. Understand strategies to leverage and *bridge* available public health resources in rebuilding the health of a community devastated by a large environmental event

Issue

Environmental Disasters do happen!!!

- Aqueous spills
 - 1976, Seveso, contaminated with dioxin
- Gas releases
 - 1984, Bhopal, methyl isocyanate
- Explosions
 - 2005, North Korea, ammonium nitrate explosion on train

TABLE. Most common hazardous substances released during rail events — Hazardous Substances Emergency Events Surveillance (HSEES) system, 16 states*, 1999–2004†

Substance	No. of releases‡	(%)
Sulfuric acid	73	(5.6)
Sodium hydroxide	60	(4.6)
Hydrochloric acid	53	(4.1)
Ammonia	51	(3.9)
Methanol	36	(2.8)
Phosphoric acid	30	(2.3)
Mixture	27	(2.1)
Argon	22	(1.7)
Ethylene glycol	22	(1.7)
Diesel fuel	19	(1.5)
Ethanol	17	(1.3)
Hydrogen peroxide	16	(1.2)
Potassium hydroxide	15	(1.1)
Alcohol NOS**	11	(0.8)
Ammonium nitrate	11	(0.8)
Chlorine	11	(0.8)
Sodium chlorate	11	(0.8)

* Alabama, Colorado, Iowa, Louisiana, Minnesota, Mississippi, Missouri, New Jersey, New York, North Carolina, Oregon, Rhode Island, Texas, Utah, Washington, and Wisconsin.

† 2004 data are preliminary.

‡ A total of 1,299 substances were released during the 1,165 rail events.

¶ Substances mixed before release (e.g., benzene/toluene).

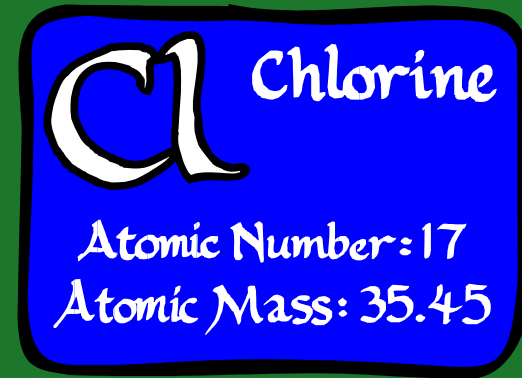
** Not otherwise specified.

Rail Events
are common!


CDC, *et al.*, 2005

Chlorine Gas

- Chemical irritant
- Highly corrosive
- Extremely reactive
- Over 3 times heavier than air
- WWI chemical weapon that killed thousands



Health Outcomes

- 
- Injury
 - Response
 - Chemical burns on the skin, eyes, or airways
 - Acute Respiratory Distress Syndrome (ARDS), pulmonary edema, death
 - Illness
 - Rebuilding
 - RADS (reactive airways dysfunction syndrome), pulmonary fibrosis, PTSD (post-traumatic stress disorder)
 - Irreversible damage
 - permanent pulmonary function decrement, permanent traumatic stress-related disorders



Graniteville, South Carolina, 2005

9 dead, 15 ICU for
more than 2 days, 72
hospitalized, 525
treated, 5,400 evacuated

MMWR, 2005

indicated that, despite a huge influx in the number of patients, the medical system was intact and functioning effectively. As seen in other disasters, rapid health assessments can identify immediate health needs and help prioritize public health interventions (4).

Active disease surveillance was useful in identifying disease events and clusters requiring intensive investigation. Although active surveillance demonstrated an increase in the number of acute diarrhea cases, much of this increase can likely be attributed to active searching for rather than passive reporting of cases. Concerns by WHO and other authorities about post-tsunami infectious disease mortality have centered on massive outbreaks of cholera and other epidemic forms of diarrhea (5). In comparison with the post-tsunami rates of diarrheal disease observed in Thailand (2,950 cases per 100,000 population), the rate of diarrhea during previously studied outbreaks in disaster settings in other countries has been much higher (i.e., 87,000–120,000 cases per 100,000 population) (6).

The increased number of wound infections suggests that many who survived the initial impact of the tsunami were injured by debris (7). A large tsunami in 1988 in Aitape, Papua New Guinea, had high numbers of persons with traumatic wounds; an Australian team of three surgeons and one nurse reported performing 182 surgical procedures in 15 days (8). The large number of enteric pathogens cultured from wounds in Thailand suggests surface contamination with enteric pathogens or true polymicrobial infections. Treatment should include empiric antibiotic coverage for a range of organisms until results from wound tissue cultures are available to guide therapy. Infection with organisms commonly associated with wounds exposed to sea water, including *A. hydrophila* and *Vibrio vulnificus*, should be considered in the differential diagnoses of these patients (9,10).

Substantial challenges remain for Thailand, including identification of approximately 5,000 bodies and reconciliation of remains with the bereaved in Thailand and other countries. Forensic experts from Thailand and approximately 30 other countries are working together to complete the identification and processing of human remains. Other challenges include maintaining active surveillance to detect infectious disease outbreaks, treating wound infections, preventing post-traumatic injuries, maintaining safe drinking water and sanitation, and meeting mental health needs. As of January 19, a total of 7,423 survivors had sought psychiatric help (MOPH, unpublished data, 2005). Further mental health interventions will likely be needed to mitigate the postdisaster effects on residents of coastal communities.

References

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5. World Health Organization. Situation report 4. Geneva, Switzerland: World Health Organization; 2005. Available at http://www.who.int/hac/crisis/international/asia_tsunami/sitrep/04/en.
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7. CDC. Surveillance for fatal and nonfatal injuries—United States, 2001. *MMWR* 2004;53:20–1.
8. Holian AC, Keith PP. Orthopaedic surgery after the Aitape tsunami. *Med J Aust* 1998;169:606–9.
9. Caillieux V, Dupont MJ, Hory B, Amellom D, Michel-Briand Y. Why did infection with *Aeromonas hydrophila* occur when water contains so many other microorganisms? *Clin Infect Dis* 1993;16:174.
10. Tacket CO, Brenner F, Blake PA. Clinical features and an epidemiologic study of *Vibrio vulnificus* infections. *J Infect Dis* 1984;149:558–61.

Public Health Consequences from Hazardous Substances Acutely Released During Rail Transit — South Carolina, 2005; Selected States, 1999–2004

On January 6, 2005, two freight trains collided in Graniteville, South Carolina (approximately 10 miles northwest of Augusta, Georgia), releasing an estimated 11,500 gallons of chlorine gas, which caused nine deaths and sent at least 529 persons seeking medical treatment for possible chlorine exposure (1,2; South Carolina Department of Health and Environmental Control [SCDHEC], unpublished data, 2005). The incident prompted the Agency for Toxic Substances and Disease Registry (ATSDR) to review data from its Hazardous Substances Emergency Events Surveillance (HSEES) system and update an analysis of 1993–1998 railroad events (3). The HSEES system is used to collect and analyze data concerning the public health consequences (e.g., morbidity, mortality, and evacuations) associated with hazardous-substance-release events* that occur in facilities or during trans-

*An HSEES event is the acute release or threatened release of a hazardous substance(s) into the environment in an amount that requires (or would have required) removal, cleanup, or neutralization according to federal, state, or local law (4). A hazardous substance is one that can reasonably be expected to cause an adverse health effect.

Local and State Health Department Goals in *Response*

- Enumerate the impact of the event on the public's health
 - Identify victims of the chlorine spill
 - Toxic
 - Traumatic

Goal in Rebuilding the Health of the Community

- Prevent an epidemic of long-term disease
- Restore the health of the community



Strategies



- Ask the right questions
- Find the right resources
- Do the right things



Key Questions

1. Are all the potential health effects evident immediately following the event?
2. Did we enumerate all the victims?
3. Did everyone who needed care seek/receive care?
4. Have all the victims completely recovered to full health?
5. Are the associated health problems only short-term, with no long-term health consequences?

Issue: Natural History

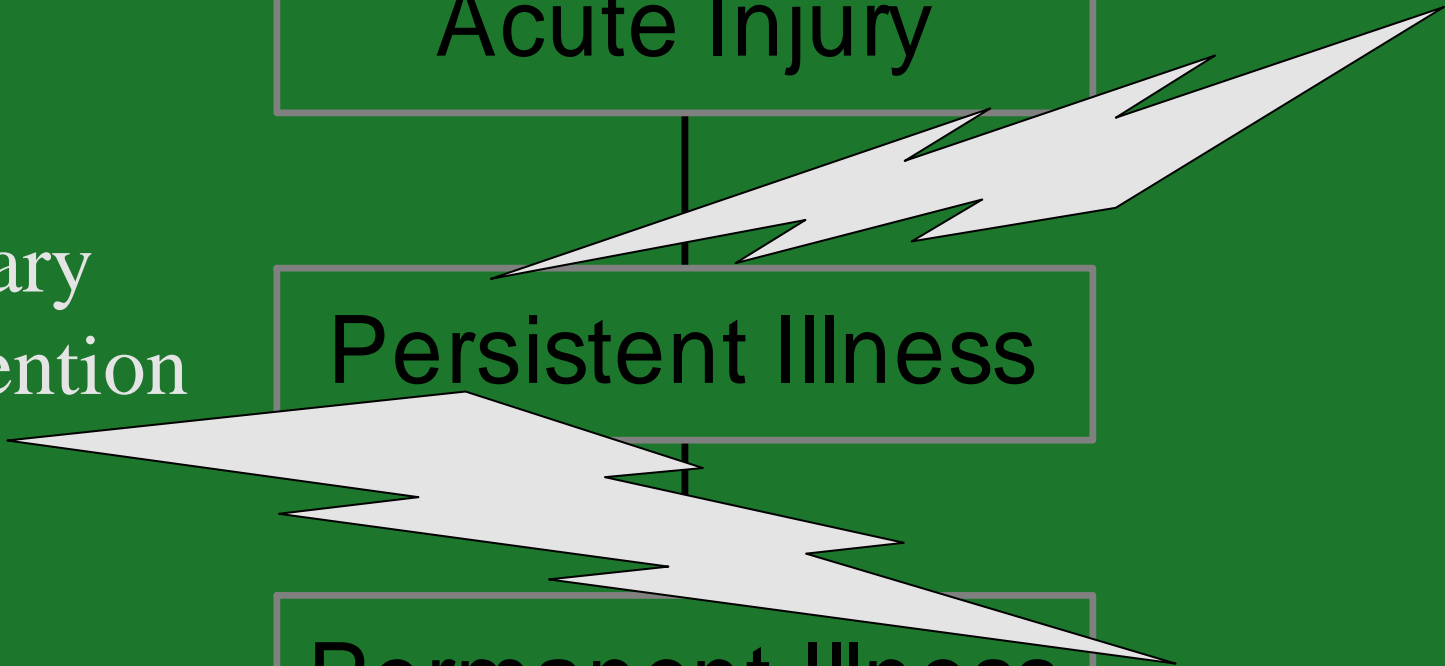
Secondary
Prevention

Acute Injury

Tertiary
Prevention

Persistent Illness

Permanent Illness





Now what?

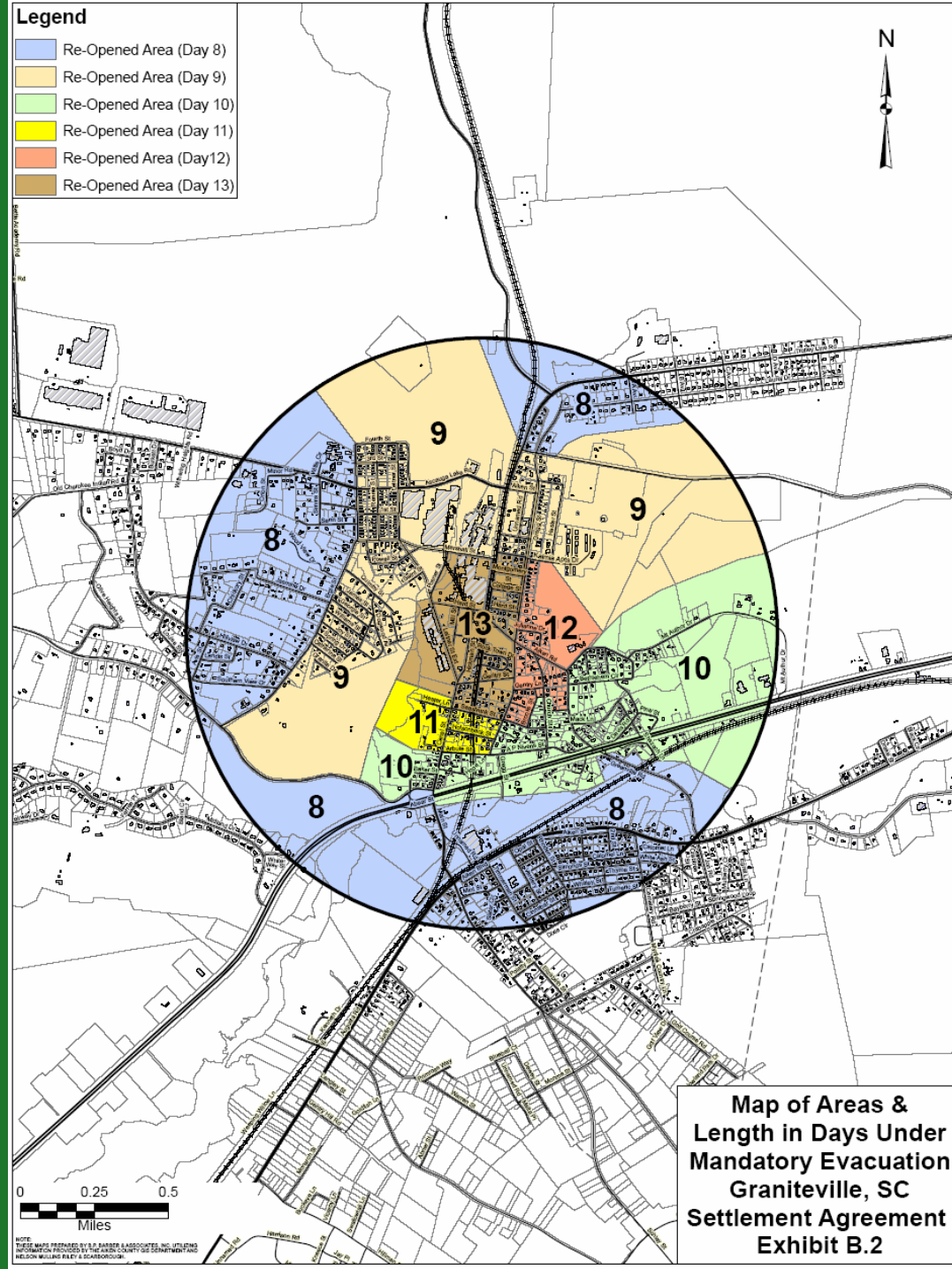


- Situation:
 - Acutely injured victims may develop long-term health problems
 - Apparently we did not enumerate every victim, perhaps due to the surge
 - Many people did not seek/receive treatment, often because they perceived that they were not as sick as the others and didn't want to tie-up care
 - People were still reporting symptoms and pursuing treatment
 - People may potentially develop permanent lung injury and/or persistent psychological illness unless treated

Issue

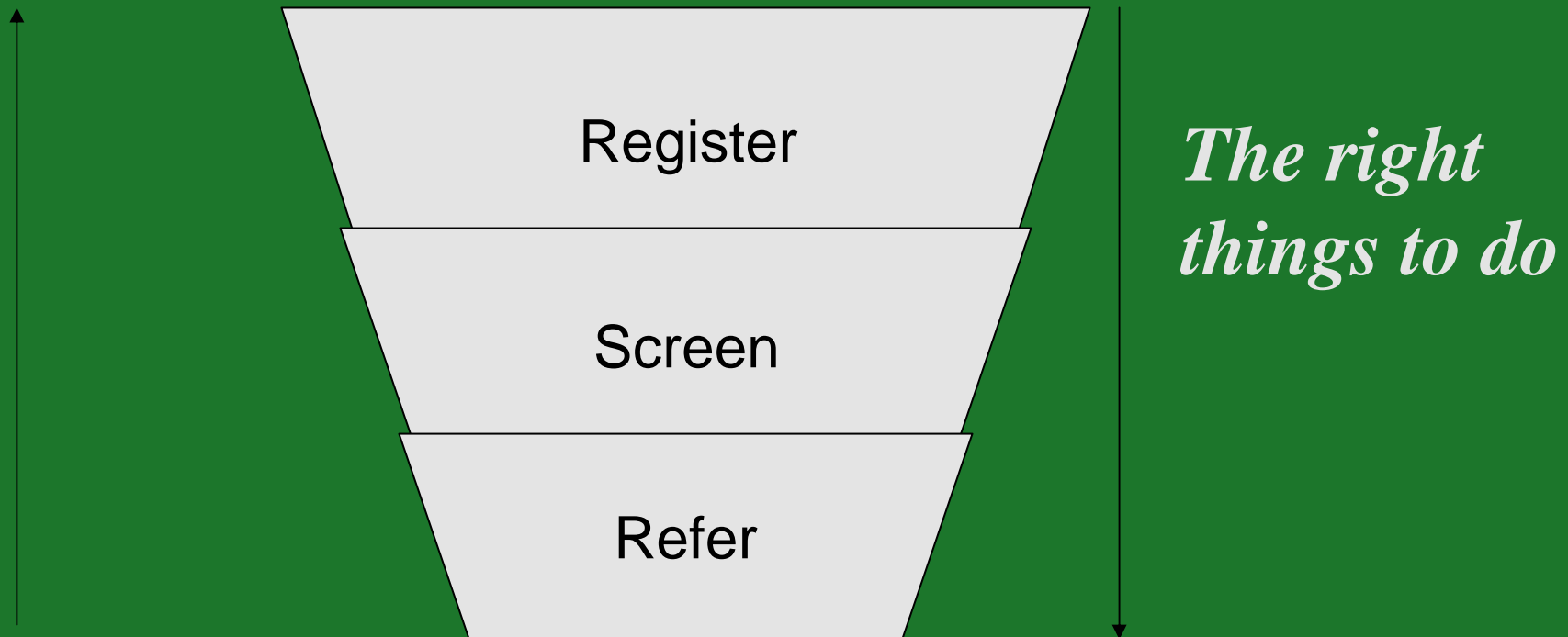
- Spills often occur in communities suffering from racial &/or socio-economic inequality, like Graniteville

Elliott, *et al.*, 2004



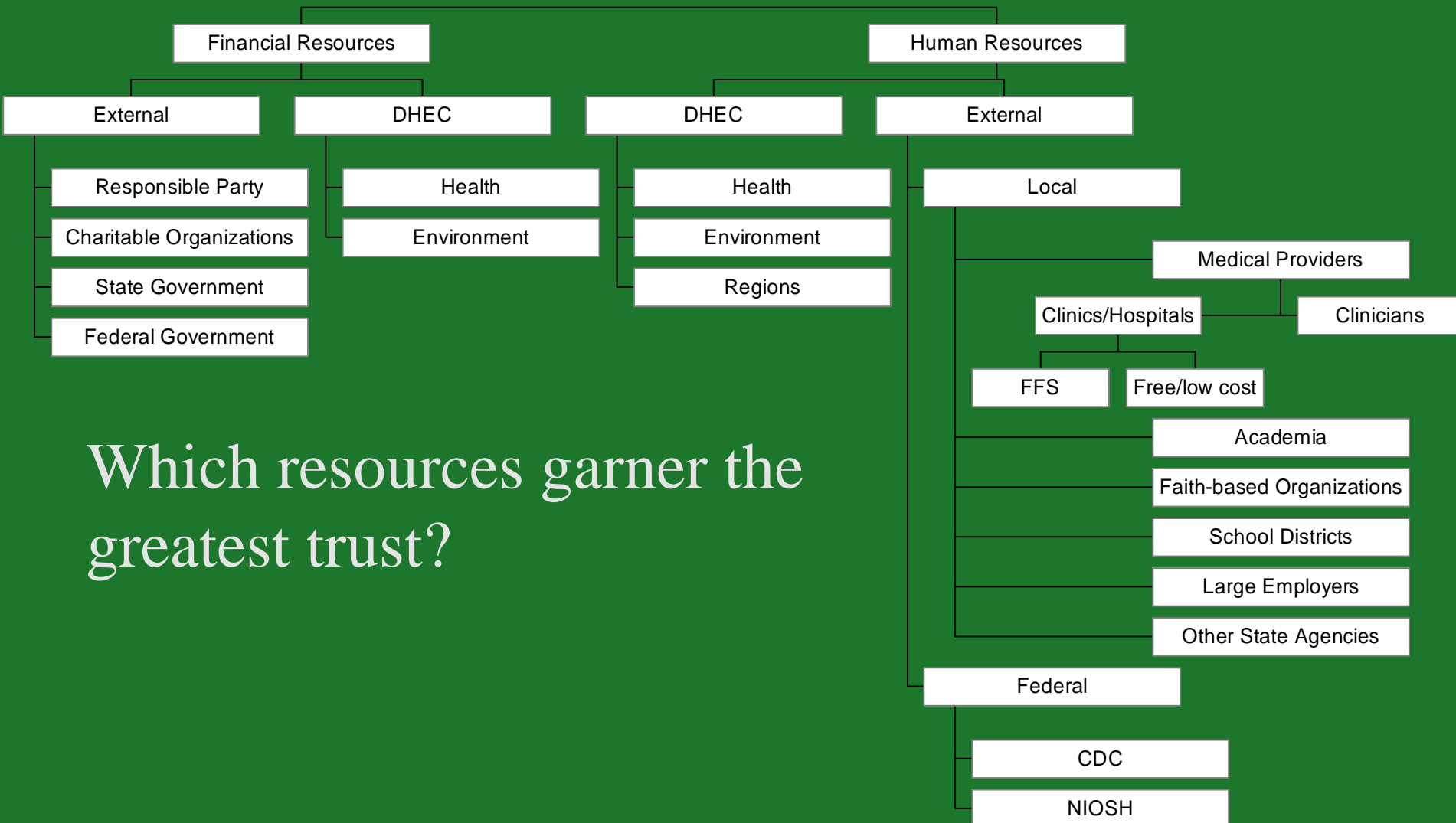
What should we do?

- Not, “what can we do?”





What are our resources?



Which resources garner the greatest trust?



Issue:

Financial Resources

- Responsible Party
- Charitable
- State
- Federal
- DHEC
 - Health
 - Environmental



Issue: Human Resources



- DHEC
 - Health
 - Environmental
 - Regions



Human Resources

- External
 - Federal
 - CDC
 - NIOSH





Human Resources



- External
 - Local
 - Medical Providers
 - Clinics/Hospitals
 - » Fee for service
 - » Free/low cost
 - Clinicians



Human Resources

- External
 - Local
 - Academia
 - Faith-based organizations
 - Public school districts
 - Large employers
 - Other state agencies



Partners

- Graniteville Community Coalition
- USC-Aiken
- Dorn VA Hospital
- Aiken Regional Hospital
- Arnold School of Public Health, USC
- Bethlehem Missionary Baptist Church
- Graniteville First Baptist Church
- DMH Aiken/Barnwell Mental Health Clinic
- Local area clinicians
- Region 5/Aiken County Health Department



Health Care Providers (Care Team Tech (C.T.T.), R

Abbott	Amanda		
Beltraw	Edwin		
Buckett	Rachel	C.T.T.	
Caise	Sharon	C.T.T.	
Carter	Alice		
Carter	Karen		
Chandler	Thelma		
Cruz	Juan		
Daniels	April		
Denny	Peggy	R.N.	
Egnezzo	Carmela	C.T.T.	
Eidson	Ed		
Enns	Pam	R.N.	
Eubanks	Brenda		
Gallego	Karen		
Goodwin	Patricia		
Gunter	Lori S.		
Hembree	Melissa		
Johnson	Debra	C.T.T.	
Lackey	Tammy	C.T.T.	
Mallen	Wilma		
Moland	Latessa	C.T.T.	
Morano	Wanda S.		Yes
Nealous	Gwendolyn		
Perez	Rachel	R.N.	
Pixley	Natisha		
Price	Dawn L.	R.N.	
Reed	Nancy		
Robinson	Sherry		
Screen	Karen	C.T.T.	
Shackford	David	R.N.	
Shunn	Angie		
Simmons	Ella	C.T.T.	
Ward	Ashlynn		
West	Linda	R.N.	
Williams	Lynette	C.T.T.	
Williams	Diane	C.T.T.	
Willis	Teresa	C.T.T.	
Wilson	Jane	R.N.	
Woodward	Raquel		
Young	Cynthia	C.T.T.	

USC-CPHP



Bridging the Public Health Community

Physicians (Physician Assistant (P.A.), Nurse Practitioner (N.P.))

Best	LaVonda	N.P.	
Engle	Andrina		
Englee	Mae Jean	M.D.	
Felkel	Charlene	N.P.	
Gordon	Gerald	M.D., FACP	Yes
Johnson	Monica	M.D.	
Jordan	Ben	N.P.	
Mishra	Seema	M.D.	
Taylor	Ben		

Aiken Regional Medical Centers-Cardiopulmonary

Bradshaw	Richard	R.R.T.	
Holsomback	Susan		Yes
Sheets	Anna	R.R.T.	
Smith	Robert	R.R.T.	

Aiken-Barnwell Mental Health Center Employees

Carges	Kimberly	MS	Yes
Champlin	Denice L.	MSW, ACSW	Yes
Bradshaw	Jennifer		Yes
Young	John C.	MSW, LISW	Yes

Facility Contacts

Abraham	James	Pastor	Yes
Hendricks	Steven	Pastor	Yes
Mathis	Elease		Yes
Wright	Louisiana		Yes

CDC Employees

Callahan	David	M.D.	Yes
Crocker	Deidre	M.D.	Yes
Johnson	Anna M.		
Moolenaar	Ronald L.		Yes
Wenck	Mary Anne		Yes

USCA Employees

Ball	L. Julia	R.N., Ph.D.	
Botsch	Bob	Ph.D.	
Brantley	Marjorie		
Corkrin	Toni	R.N.	
Eidson	Lauren		
Fetterolf	Monty	Ph.D.	
Fickbohm	William		
Jennings	Kim		
Kirby	Jason		
Newell	Kim		
Parks	Hannah		
Pirkle	Bill	Ph.D.	
Randall	Christy		
Ruszczyk	Ron	Dr.	
Shamkhani	Sandy	(Arezo)	
Steel	Ginger		
Stoudemayer	Chris		
Walliser	Iris		
Warren	Melissa		Yes
Williams	Hannah		Yes
Wilson	Barbara		
Wilson	Sharon		
Cooler	Caroline		
Clark	Stacy		

Additional Contacts

Baddour	Rafi		
Broder	Jeffrey N.	M.D., P.C.	
Coleman, Jr.	James L.	Dr.	
Gant	Tracy		
Gray	Bart		
Hinz	Ellen		
Mattox	Herb		
Roemmich	Lola		



Register:

DHEC Train Wreck Registry

- Contracted to the USCA Telephone Bank
- > 850 people registered
- Designed by:
 - DHEC (local, regional, and central office)
 - USC-Aiken
 - USC CPHP



Graniteville Community Health Registry

SC DHEC is monitoring the health effects of the chlorine spill that occurred on January 6, 2005. If you were in Graniteville during this event, please call 803-641-3332 to join the health registry so we can better understand the impact of this accident on the health of the community.

If you were in your home, working or traveling through Graniteville the day of the accident, you may qualify for a free medical evaluation to be provided by SC DHEC. All information will be kept confidential and will help inform you about any effects that the chlorine had on your health.

Please call, even if you did not get sick, because every person counts.

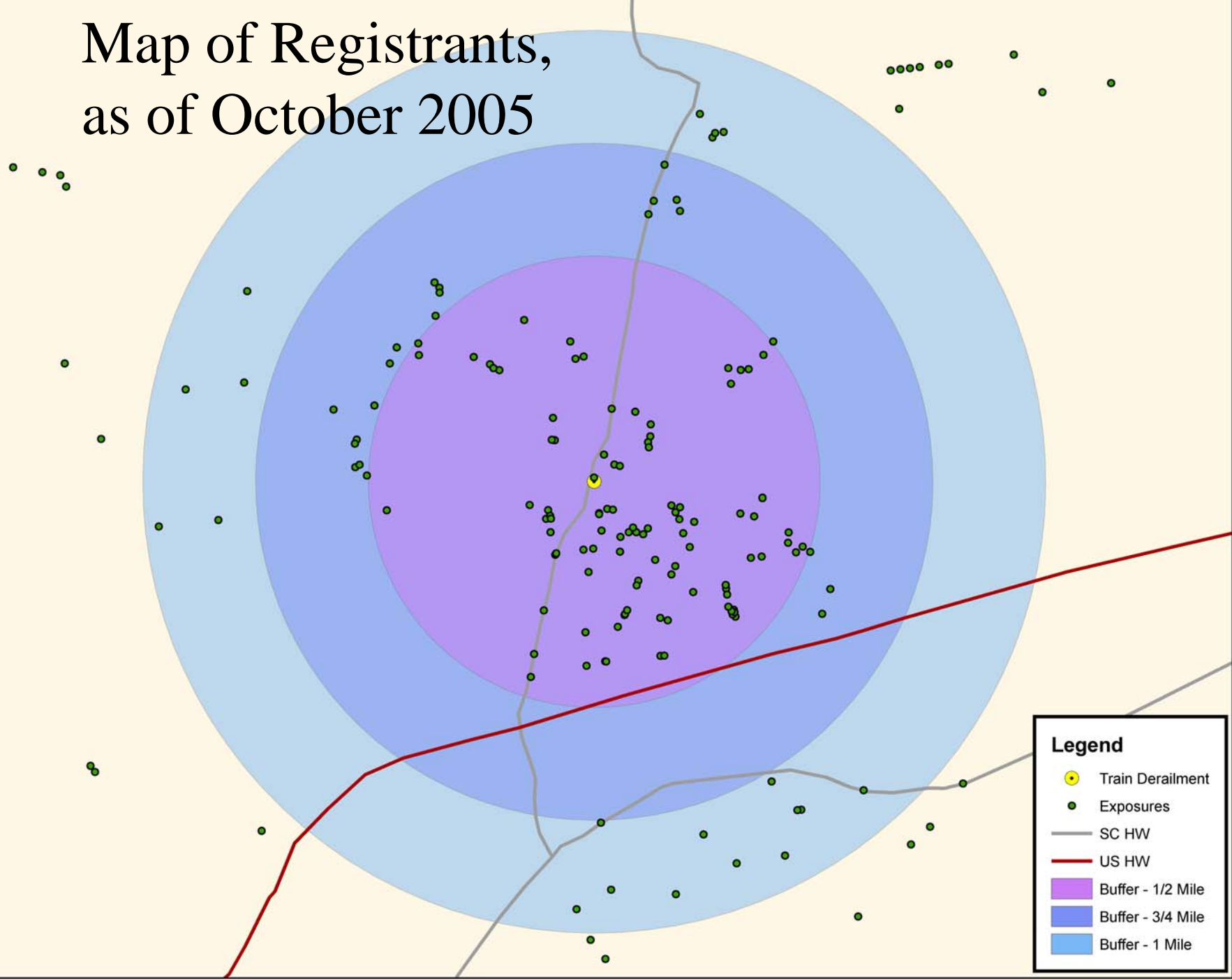
803-641-3332

A telephone operator is available to take your call 7 am until 10 pm, 7 days a week.



	South Carolina	Aiken County	Warrenville	Graniteville	SC DHEC Registry	SC DHEC Sub- group Screened
Population	4,012,012	142,552	6,652	7,009	791	259
under 5 yrs., %	6.6	6.7	7.5	8.4	5.1	3.5
under 18 yrs., %	25.2	26.2	27.0	29.8	21.5	17.0
65 yrs. and over, %	12.1	12.8	12.4	12.0	14.2	20.5
Female , %	51.4	51.8	50.3	52.0	50.3	55.6
White , %	67.2	71.4	87.4	69.6	67.8	63.6
Black or African American , %	29.5	25.6	10.0	26.9	27.3	31.8
American Indian and Alaska Native , %	0.3	0.4	0.5	0.6	0.8	0.8
Asian , %	0.9	0.6	0.3	0.3	-	-
reporting some other race, %	1.0	0.8	0.5	1.5	1.8	0.8
reporting two or more races, %	1.0	1.2	1.4	1.2	0.6	0.4
of Hispanic or Latino origin, %	2.4	2.1	1.3	2.1	2.0	3.1
Speak Spanish			1.5	2.8	1.5	1.9
High school graduates, % of age 25+	76.3	77.7				
Bachelor's degree or higher, % of age 25+	20.4	19.9				
Less than 9th grade, % of age 25+			16.6	9.6	8.4	10.3
9th to 12th grade, no diploma, % of age 25+			19.5	19.1	19.4	20.1
High school graduates, % of age 25+			35.1	34.8	43.0	39.7
Some college, no degree, % of age 25+			17.5	20.9		
Associate Degree, % of age 25+			4.8	7.5		
Some college/Associates degree, % of age 25+					18.7	22.1
Bachelor's degree, % of age 25+			3.6	5.3	7.0	5.4
Graduate or Professional degree, % of age 25+			2.4	2.8	3.5	2.5

Map of Registrants, as of October 2005





Screen: Graniteville Community Health Screenings



- Included:
 - assent/consent
 - vital signs
 - medical/exposure history
 - physical exam
 - collection of exhaled breath condensates
 - pulmonary function testing
 - psycho-social morbidity screens
 - clinical and psychological consultation
 - subsequent methacholine challenge test at Aiken Regional Hospital in medically eligible

Screen

- Contracted with Aiken Regional Hospital's NIOSH Certified Occupational Medicine Unit for Pulmonary function exams/medical equipment (*negotiated an extremely reduced price*)
- Contracted with local nurses/physicians to provide medical assessment (*many volunteered*)
- Contracted with USC-Aiken for sample collection/storage/analysis

Screen

- Coordinated efforts through USC-A Registry staff (office space/support provided by DHEC regional office *free of charge*)
- Hosted by local churches/DMH clinic (*free of charge*)
- Partnered with the local DMH clinic to provide psychological social workers for psycho-social screening/consultation (*free of charge*)

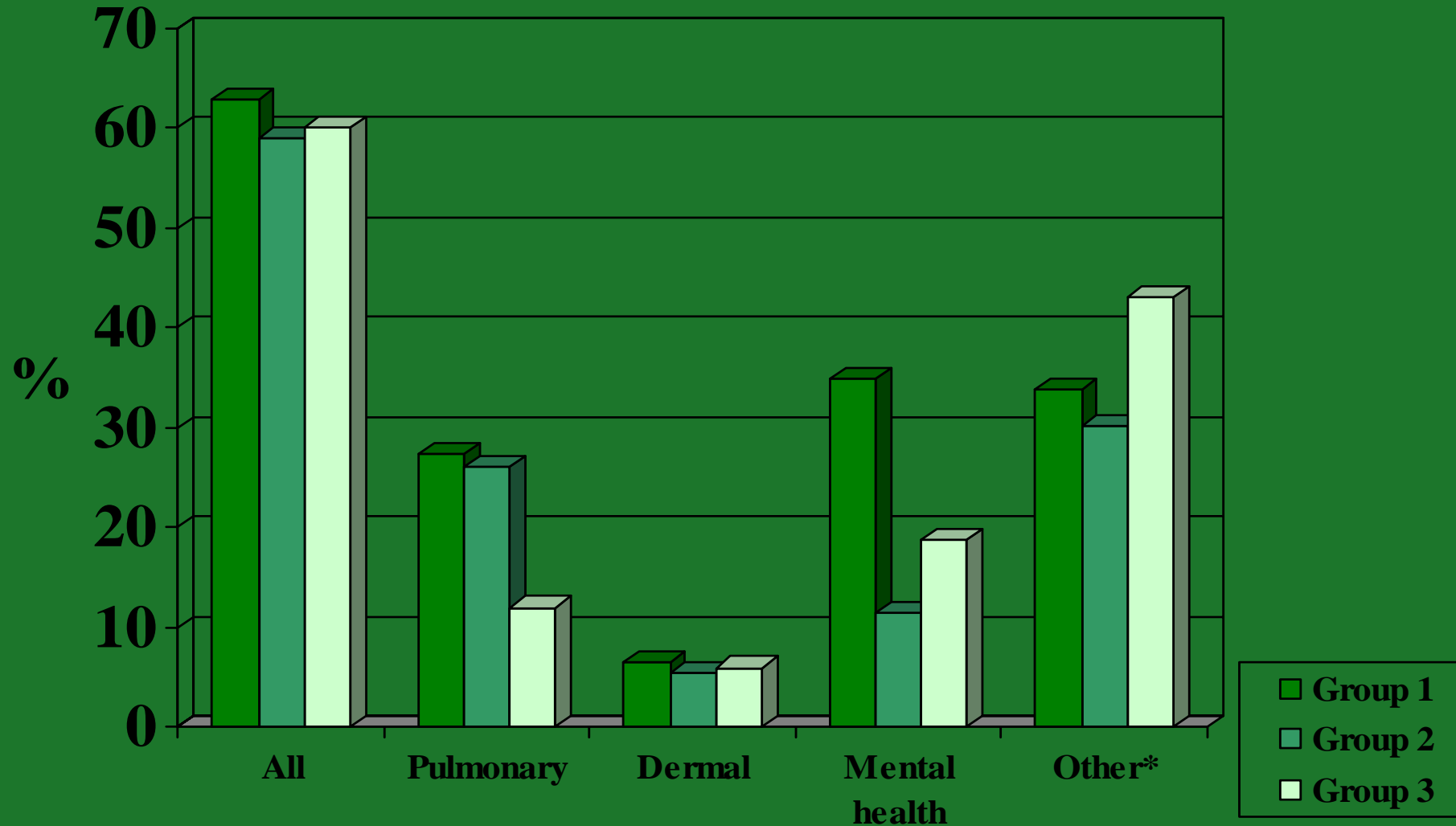
Screen

- Provided a costly medical screening in a very cost-efficient manner thanks to all the volunteers, reduced fees, and leveraged resources
 - total costs: <\$500/person screened + methacholine challenge test fees (~\$2,000 service)

Refer

- Physicians reviewed screening results and made recommendations for follow-up care for specific medical specialties
- Psychological social workers reviewed mental health screeners and made recommendations for follow-up care based on those results
- Screened victims were provided list of available medical and mental health care resources in their area, including additional insurance and low/no-cost care options

Sub-set screened that were recommended for follow-up care





Graniteville Community Health Screenings



- 259 people received a free health assessment
- >60 received supplemental methacholine challenge testing
- Have detected patients with RADS, PTSD, and other illnesses that have been referred for clinical follow-up care
- Have funded these efforts continuously for 1 year



Strategies



- Ask the right questions
- Find the right resources
- Do the right things

Issues

- Environmental disasters happen, and chemical spills from rail events are common
- Environmental disasters can result in permanent and long-term health consequences
- Financial resources to rebuild are limited
- Human resources to rebuild are limited
- When unconventional resources are tapped, human and financial resources can bridge these gaps



- Thank you